

N^o. I.

MATHEMATICAL, GEOMETRICAL, AND PHILOSOPHICAL DELIGHTS:

CONTAINING
ESSAYS, PROBLEMS, SOLUTIONS,
THEOREMS, &c.

SELECTED FROM AN EXTENSIVE CORRESPONDENCE.

By THOMAS WHITING,

TEACHER OF THE MATHEMATICS,

EDITOR OF THE SCIENTIFIC RECEPTACLE,--AUTHOR OF THE MENTAL ACCOUNTANT,
AND SCHOOLMASTER'S ASSISTANT.

L O N D O N:

Printed for the *Editor*, and sold by T. LONGMAN, *Paternoster-row*,

M DCC XCH.

PRICE ONE SHILLING.

THE EDITOR begs leave to inform his generous correspondents, that he has just published No. 3, OF THE SCIENTIFIC RECEPTACLE, containing Enigmas, Charades, Queries, Questions, Solutions, &c. and that it will be continued Half-yearly, as usual; published by Mr. LONGMAN, Paternoster-Row, London; where may be had,
 1. A COMPREHENSIVE SYSTEM of ALGEBRA, by JOHN DAVISON, price 4s. in boards. 2. A NEW SYSTEM of ARITHMETIC, by JOHN DAVISON, price 2s.
 3. The MENTAL ACCOUNTANT, by T. WHITING, price 1s. stitched. 4. The SCHOOLMASTER'S ASSISTANT, by T. WHITING, price 2s.

We beg leave to make the following remarks concerning the present Undertaking, in as concise a manner as possible.

THIS Work is to be continued Half-yearly, and to contain both new, and such other Questions as are in Magazines, &c. (except Martin's) 2. That all Questions shall be proposed on the Wrapper, and re-printed in the Work, and the Solution under it. 3. That if any Question should not be truly limited, we hope our most able correspondents will be pleased to alter them. 4. If any Question should be found in any Author, we hope to be informed of it, that it may be passed by in silence. 5. We shall first take the Questions from the London Magazines, and then proceed to others. 6. If this plan be not generally approved of, we shall make such alterations as may be thought necessary. 7. Some of the Questions on the cover this time are new, and some proposed before, but unanswered. 8. No. 2 of this Work to be published on the 15th of October, 1792. 9. All who chuse to favour this undertaking, are requested to send their productions (post paid) before the 1st of August, directed to Mr. WHITING, near Westminster-Bridge, Lambeth.

Questions to be answered.

Question 1. SUPPOSE three-fourths of the Solidity of a basin, in form of a half Sphere, whose diameter is 40 inches, standing with its base parallel to the horizon, to be filled with rain water; if a cylinder of dry oak be laid upon the surface of the said water, its own weight is just sufficient to sink it till each end of the cylinder just rest on the sides of the basin, and at the same time raises the water up to the brim. Required the dimensions of that cylinder?

Question 2. An inflexible rod, or cane of equal thickness, 3 feet long, is suspended by the end, and made to revolve by a conical motion. Required the vertical $\angle$ of the cone, and time of revolution, when the same revolves in the time of one vibration of an angular pendulum, formed by two other such rods, subtended by the vertical $\angle$ of the cone?

Question 3. What questions are left unanswered, (and have not been repropoſed in any other work) in the Palladium and other periodical publications, as we intend repropoſing all ſuch questions on the wrapper of this work.

Question 4. To what height above the City of London muſt a perſon be raiſed, on December 18, 1792, at half paſt eleven at night, to ſee the moon's lower edge?

Question 5. There is a hollow ſphere of copper, whoſe external diameter is 3 inches, and its weight equal to an equal bulk of common water, required the thickneſs of the ſhell, and from what height it muſt be let fall, ſo as juſt to touch the bottom of a reſervoir filled with water, whoſe depth is 4 feet?

Question 6. There is a conical building, whoſe height is 40 feet, and diameter of its baſe 16 feet, an owl ſitting on the top ſees a mouſe running round its baſe at the rate of 5 miles an hour, which ſhe gives uniform chaſe to, at the rate of 6 miles an hour. How far muſt the owl go before ſhe overtakes the mouſe?

Question 7. There is a cylindrical caſk, whoſe internal diameter is 2 feet and internal length 5 feet, and over this ſtands another caſk of the ſame dimensions full of common water, with a hole at the top to admit the air, and ſuppoſe thoſe caſks be connected together by a tube, whoſe internal diameter and length is each one inch; and ſuppoſe a cork put into the tube to prevent the water running in; then ſuppoſe half the air exhausted out of the under caſk, and the barometer at 29 inches; now ſuppoſe the cork taken out, how much water will deſcend? and in what time will the evacuation ceaſe?

Question 8. On what day in 1793 will the time between the moon's ſouthing and ſetting be a maximum?

Question 9. The chapel at Bolton (ſtanding in the latitude of $54^{\circ} 38' N.$) is an ancient building; over the north window is an inſcription in Saxon characters, importing that the building was finiſhed on the 20th of May, when the ſhadow of the ſteeple bearing N. E. by E. $6^{\circ} 41' 30'' E.$ was in ratio to its height as 54 to 44, and the angle included by the ſteeple and ſhadow was $95^{\circ} 3'$; required the time of the day when the obſervation was made, and how long it is ſince the ſaid chapel was built?

Question 10. Required the equilibrium power of an overſhot water wheel, at its circumference as ariſing from the weight of water only; having the following data. Diameter of the wheel 24 feet, number of buckets 60, revolutions in a minute 10, feeder of water for driving it 1200 hogſheads per hour; the water is thrown into the third bucket from the perpendicular, through and about the center, on the leading ſide of the wheel, and leaves the ſame five buckets before it arrives at the ſaid perpendicular below; the momentum of the water being allowed for the friction?

Question 11. What is the reaſon that a roll of brimſtone cracks, and ſometimes breaks, when it is held in a warm hand?

Question 12. What is the reaſon that glaſs may be cut with eaſe under water with a pair of ſciſſars, but not in air?

Question 13. In what year after 1800 will the number of days between Christmas Day and Shrove Sunday be a maximum?

Question 14. Suppose a cylinder, whose diameter is 2 inches and length 100 yards, be fixed in a horizontal position, and to move freely about an axis passing through its centre, and suppose a thread be wrapped about it in such a manner that each round may just touch the preceding one; the diameter of the thread .01 of an inch. How far must a person go in unwinding it, supposing they keep the thread always at right angles with the cylinder, and that they go as far off as the extremity of the thread will permit?

Question 15. Suppose a globe, whose diameter is 12 inches, be situated in the same manner as above, and a thread wound round of the same dimensions, and suppose a person to take hold of the end of the thread and to go in such a manner as to keep the thread at right angles with the axis of the globe, to find the nature and area of the path a person must describe in so doing?

Question 16. There is a room whose breadth is 15 feet and length 20 feet, and there is a slack small string fixed up by its ends to the opposite corners of the ceiling, that is over the diagonal, and a small lead weight being fixed to the middle of the thread and made to oscillate, made 20 vibrations in a minute. Required the length of the string?

Question 17. A person standing at an unknown distance from 2 fires (not in a line between them) of equal size found the ratio of their heat as $2.5 : 3$, but walking 10 yards nearer to the farthest fire their ratio was as $2.9 : 3$. Required his distance from each fire in both situations, the distance of the fires being 25 yards?

Question 18. Given the base and least side, and the $\angle$ contained between the greater side and $\perp$ drawn from the vertical $\angle$ and terminating in the base to construct the triangle?

Question 19. Given the base and either of the angles at the base, also the radius of the inscribed circle, to construct the triangle?

Question 20. Given the base, the perpendicular, and the complement of the least angle at the base, to construct the triangle?

Question 21. It is required to find a figure contained within three circular lines, that shall be equal in area to the quadrant of a circle, purely geometrical?

Question 22. A person has a meadow in form of a parabola, containing an acre of ground, and its greatest ordinate is in ratio to its axis as $3 : 5$. Required the length of a rope, (one end of which is fixed in the vertex) whereby a horse is to be fixed so as to eat half an acre of grass; supposing the rope fixed to the horse's head?

N^o 2.

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WE shall admit all Questions, if original, whither easy or difficult, and the proposers need not send their Solutions, except they choose it. But the Editor will not be responsible for their not being answered.

Such as are answered truly by one or more correspondents shall be re-proposed in the body of the work.—By this means we shall procure many good Questions.—Such as have Solutions sent with them, shall in future be marked with a (*).

We have renounced our plan of making a collection from the Magazines; as we have original Questions sufficient without them. No. 3, of this Work to be published on the 15th of June, 1783. Solutions to the Questions proposed in this Number; also those unanswered in No. 1, to come to hand by the 1st of April, directed (post paid) to Mr. WHITING, near Westminster-Bridge, Lambeth.

Mr. Farey and Mr. Ryley observe, that Question 2 on the wrapper N^o 1, has been done in Carhan's Diary for 1786, and in the Town and Country Magazine for 1784.—Question 12 Mr. Farey observes has been done in the Scientific Repository.—Question 3, Mr. Farey says he shall be happy on every occasion to communicate any information, respecting the questions, as he has a large collection of Periodical Publications.—Question 7 Mr. Farey says that the air in the lower cask will escape in bubbles, and consequently all the water will descend.—The Editor observes that the Question may be solved upon supposition, that this does not obtain.—Mr. Bickford answered Question 4, 10, 14, & 16, Mr. Hewitt answered 4, 8, 9, 13, 14, 18, 19, 20, and 22.—Mr. Farey answered 9, 10, 18, 19, and 20.—Mr. Ryley answered the 2d.—We shall give a list of what each person answered on the wrapper each time; and a complete catalogue at the end of the volume.

New Questions.

1. Required a solution to question 97, Davisons Algebra.
2. Given the inclination of the plane ABCD with the horizon $= 20^\circ$, at the point B is fixed a string 36 inches long, and at the other end a ball. Now suppose the string to be stretched into the horizontal direction AB, and then the ball be suffered to descend, in what time will the ball move through the quadrant of the circle AD.
3. By Mr. Thomas Milner. In the month of February, 1794, the moon will be totally eclipsed. Required the latitude and longitude of that place where the moon is vertical at the middle of the eclipse?
4. AB is a cylindrical tube 72 inches long, fixed at the point B as a center, about which it moves freely, at B in the tube is a ball supposed without weight. Now while the end A of the tube moves through the quadrant of the circle AC, the ball moves along the tube from B towards the end A. Required the investigation of the curve described by the ball?—Note, The tube is placed in an horizontal position before the motion commences.
5. Given BC $= 20$ feet AB $= 10$ feet, the line AB describes a vertical circle about the point B. At London, on May, the 19th, 1792 at 5 P. M. I observed the shadow of the point B to describe a curve on the horizontal plane; it is also known that the index AB points exactly to the point of the compass the sun sets upon. Required the following particulars, viz. The nature and area of the curve at the time of observation? The points of the curve where the shadow moves the quickest? And what time on the given day the area of the space bounded by the shadow is a maximum?
6. By Mr. Gregory of Yaxley.—Required my age in years, when it is known that the sum of the two digits which express it is 9; and if half my age be squared, that square will be equal to my age reversed.

7. By the same.—There is a common helix or spiral (such as described at page 264 Fenning's Book of Knowledge, edition 4.) whose length, when continued ten times round, is known to be 1319.46906. What is the distance of the two centers, from which the femicircles that constitute the spiral were struck?

8. What time on December 10, 1792, will the altitude of the sun and moon be both equal at London.

9. By Mr. W. Burden, near York.—There is a rectangular field ABCD, through which parallel to the longest side AB or CD runs a ditch EF, over this ditch at G is a bridge at the distance of a chains from the angle A, and at b chains from the angle C, the whole field measures c square chains, and the sines of the angle's AGE, and IGC are as m : n. Required the dimensions of the field?

10. By Mr. Thomas Crosby, of York.—A gun whose angle of elevation is 45° , and impetus 22500 feet, planted at a place W, is able to carry a ball 60000 feet, to another place E full East of the former: to what point of the compass, and at what angle of elevation ought a gun at M to be directed to, whose impetus is 44100 feet; and bearing from the first place E.S.E. 40000 feet, so that the two guns being fired at the very same instant, the balls may hit each other in the air.

11. There is a cask of good sound heart of oak in form of the frustum of a cone, its external dimensions are as follows, viz. slant height 54 inches, top diameter 24 inches, and bottom diameter 18 inches; it being filled with common water weighed 848.4834 pounds avoirdupoise. Required the thickness of the wood, admitting that a cubic inch of oak weighs .536569, and a cubic inch of water .578697 oz. avoirdupoise.

12. By Mr. Thomas Crosby, of York.

Ingenious Philomaths pray tell to me,

Height, age and fortune of my charming she :

Which from the given equations* will appear,

I'll strive to do as much for you another year.

$$\begin{aligned} * \quad & \frac{xz \sqrt{\frac{5}{13}x + z}}{x} = 1504\frac{8}{13} = m. \\ & \frac{xz \sqrt{\frac{12}{25}z + x}}{z} = 78c\frac{13}{20} = n. \end{aligned}$$

Where x represents her height in inches $4-13x$ = her age, and z her fortune in pounds.

13. At London on May 24, 1792, at 10 o'clock A. M. a roller lying on a horizontal plane, and placed at right-angles to the sun, (or azimuth the sun was then on,) cast a shadow to the distance of 5 feet 3 inches. Required the diameter of the roller?

14. At London on a given day, and at a given hour, a pint pot, in form of a conic frustum of a given height, placed on an horizontal plane, had its internal superficies enlightened in a given ratio. Required the diameters?

15. On June 21, 1791, in latitude $51^\circ 32'$ at 5 in the afternoon, I was walking by the side of a gentleman's park, its form appeared nearly circular, and it was surrounded by a wall ten feet high; I walked until I came unto that point where the shadow of the wall commenced, and then measured 100 yards farther, close by the side of the wall; and then found the breadth of the shadow to be $5\frac{1}{2}$ inches. Required the area of the park, supposing it perfectly circular?

16. There is a cylindrical piece of dry sound heart of oak, fixed perpendicularly in the

ground, its height 26 feet, and diameter 13 inches, now suppose a 12 pounder, of cast iron, to be fixed to its top by a small chain 3 yards in length. With what velocity must this ball move round with, so as just to break the cylinder?

17. Given $x^4 - 4x^3 + 4x^2 = y^4 + 4y^3 + 4y^2$.
And $x^5 - 12x^3 = x^4 + 12x^2 = xy^4 + 12xy^2 = y^4 - 12y^2$. Required x and y .

18. Suppose a glass vessel, in form of the frustum of a cone, of a given uniform thickness, be placed upon a given inclined plane. How much water may be poured into it, so that it may but just support itself from falling; all the dimensions of the vessel being given; and also to point out the limits, wherein the plane must be given to render the question possible.—Note, The glass is to stand on its least diameter.

19. There is a pint pot in the form of the frustum of a cone, whose top and bottom diameters are as 5 : 7, now suppose this pot to be filled with liquor, and then inclined gently on one side, how much liquor must be poured out so that the surface of the remaining part may be a maximum when in its inclined state?

20. Suppose the earth a given cylinder instead of a spheroid, whereabouts on its surface must a corpusele be placed, so that it may be attracted with the greatest force?

21. Given two altitudes of the sun, and the time measured between them; to find the latitude by the globe.

New Queries to be answered.

1. On December, 1792, or the beginning of 1793, the obliquity of the ecliptic is a minimum. Query in what year of Christ will it be a maximum.

2. By Mr Thomas Keith.—When the moon is in the zenith the tides are highest in the zenith and nadir, because the attraction of the moon diminishes the earth's central attraction; which is the same as if the waters were impelled from the earth's centre towards the nadir. According to these laws of gravitation, why are the tides highest in the nadir when both the sun and moon are in the zenith?

3. Is the gravity of a top, when in motion, less than when at rest?

4. Is there any truth in the pretended discovery of Animal Magnetism, and has there been any book wrote professedly on the subject? If not, why called a Science if kept a secret from the general knowledge of mankind?

5. Why is the East wind hurtful to animal and vegetable life?

6. Shawls for the ladies having of late years been brought from some parts of Asia said to be made of camels hair, and sold at great prices; we call upon your ingenious philosophic correspondents to say what particular quality they have to make them so valuable, and to point out a criterion to know those that are really made of Camels hair from any others.

7. What is the reason, that an egg will easily break when pressed sideways, and makes such resistance when pressed at the ends?

8. From frequently drawing notes from wine glasses; (by wetting my finger and rubbing them round the edges of the glass) I have observed the sound is not produced, till the water is in a swift circular motion; produced, as I suppose, by the state of the air. And what is the reason of the sound being obstructed till the water has acquired such a motion?

9. What is the reason of spring water being warm in winter, and cold in summer?

10. By what operation is the matter proceeding from the nose augmented by a cold in the head, from whence does it originally flow; and after what manner is the dirt, &c. entering at the eyes discharged?

The Query respecting the best Mathematical Books shall be answered in the next Receptacle.

N^o. 3.

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New Questions.

1. *By Momentum.*

THE wedge one of the mechanical powers having undergone several determinations, respecting the power to the resistance; Dr. Rutherford, Dr. Hamilton, and Mr. Ferguson, contend that the power is to the resistance as the base of the wedge to the sum of the sides: Dr. Gravesend and Mr. Worster says, the power is to the resistance as the base to the height: Mr. Martin, as the height to half the breadth of the base: But Mr. Emerson says, the power is to the resistance as the base to one side only. A full investigation of the principles of this mechanical power is required?

2. *By Mr. J. Lowry, of Houghton.*

Given the sum of the sides, the line bisecting the verticle angle, and its prolongation till it meets the circumference of the circumscribing circle, to construct the triangle.

3. *By Mr. Thomas Whiting.*

At the point A stands a lamp on a post 10 feet high, at D stands a man 6 feet high, the man moves along the line D C, required the area of the space passed over by the man's shadow when he has gone 10 yards?

4. *By a Young Gentleman at the Academy at Greenwich.*

In the triangle ABC there is given $AB=8$, $BC=5$, and $AC=10$. Required the distance BE in the side CB continued, so that the arch FD being described with the radius ED, the parts AF, BD may be each $=3$?

5. *By Mr. O. Gregory.*

Given the radius of the base of a speric segment $=20$, and the angle formed by the said line, and a line drawn from the circumference of the base to the center of gravity $=12^\circ$; to find the content of the sphere of which this segment is a part.

6. *By Mr. Thomas Milner, of Caterick.*

Suppose, on August 1, 1771, at $14^h 30^m$ apparent time; the observed attitude of the moon's centre (exclusive of the parallax, &c) $=40^\circ$, and at 17^h to be $=50^\circ$. Required the latitude and longitude of the place of observation?

7. *By Mr. Richard Nicholson, Master of Kirkby-overblow School.*

From the point of intersection P of two given circles O and C, to draw geometrically a right line, PQ cutting the least circle in R, and terminating in the periphery of the greatest, so that PR may be $=QR$.

8. *By the same Gentleman.*

It is required to draw geometrically a right line, the length of which is a minimum, to cut off from a given triangle another triangle, having a given magnitude.

9. *By Mr. William Armstrong, Pupil in Mr. Howard's School, Carlisle.*

In a right angled triangle there is given the sum of the sides about the right angle and the side of the inscribed square, to construct the triangle.

10. *By Mr. James Denningt, of London.*

Given the difference of the angles at the base, and the perpendicular falling from the angle at the base of the given inscribed square on the line bisecting the vertical angle to construct the triangle.

11. *By Thomas Hewitt.*

Required a general rule for making right angled triangles, by having two numbers, a, b, given.

12. *By Mr. O. Gregory.*

Yaxley church, in N. lat. $52^\circ 30'$ stands on the summit of a hill which is inclined to the horizon $3^\circ 30'$. On the morning of the longest day the sun shining brightly when at due East, I found the length of the steeple's shadow, on the slant side of the hill, to be 103 yards. Now exercise yourselves ye young students, and find the steeple's height

13. *By Mr. William Burdon Acafter, Malbis.*

In a four sided field, ABCD, given $AB=820$ links, $BC=600$, $AD=760$, the angle, $\angle B=100^\circ 16'$, to determine the area.

14.* *By Mr. Olinthus Gregory, of Faxley.*

Suppose a perfectly elastic ball should fall from the top down a plane, whose length is 60 feet, and inclination to the horizon 40° , on a firm plane, parallel to the horizon, it would then rebound, and again fall on that plane. Quere, how far from the inclined plane will it fall; also, the time the ball has been in motion, when it alights after reflection.

15. *By Mr. William Burdon.*

Required the side of the greatest cube that can be cut out of a cylindrical ring of metal, its thickness being 2 inches, and internal diameter 8 inches?

16. *By Mr. John Fletcher, of Liverpool.*

If a right line AB be divided in C; and on the parts AC, BC, semicircles be described; it is required to find a point D (without fluxions) in the line AC, so that if a tangent DQ, to one semicircle, and an ordinate DR to the other be drawn, their sum will be a maximum.

17. *By Mr. Thomas Whiting.*

Two balls are let fall at the same time, one down the arch of a circle, and the other down its chord. Required the path passed over by the center of gravity of the balls?

18. *By Mr. Thomas Whiling.*

There is a field in the form of an Ellipsis (railed round) standing in the midst of a large grass field; to what part of the outside of the rails must a horse be tied so as to eat the most grass possible? Also, to determine how much may be eaten when the diameters of the Ellipse are 60 and 40 feet respectively; and the length of the cord by which the horse is tied = 30 feet?

19. *By Mr. Thomas Whiting.*

The earth being a sphere, and the density of the atmosphere to decrease in a subduplicate ratio; to find the weight of the whole atmosphere.

20. *By Mr. Lowry.*

There is a piece of land, in the form of a parabola, whose base and abscissa are a and b , (16 and 11) chains respectively. The land on one side of the abscissa is worth d (20) shillings, and on the other c (14) shillings per acre. Quere, the direction of an hedge, made from the corner of the base on the side, worth d shillings; so that the field may be divided into two parts of equal value.

21.* *By Mr. Lowry, of Houghton.*

Given $\begin{cases} 64x^2 - y^4 + 136y^2 - x^3y = 4624 \\ 176x^2 - x^4 + 64y^2 - y^3x = 7744 \end{cases}$ To find the value of x and y .

22. *By Mr. Thomas Whiting.*

Suppose the earth, a given sphere all over, covered with water 1 mile deep, to determine the velocity it must move round with so that the two frigid zones may be left dry.

23. By L. L. D. F. R. S.

Suppose a comet, containing the same quantity of matter as the moon, to pass between the moon and earth, equally distant from the two bodies, to find how high it will raise the water.

24. *By Euclid.*

To draw geometrically a line equal to a given line.

25. *By Mr. Thomas Whiting.*

Suppose the triangle ABC to revolve about the point A as a center; and that AC is a tube in which is a ball at D=1 inch from the point A; and suppose the triangle to revolve round it as a center, once the first, second twice the second, three times the third, and so on; AB=CB=10 feet. In what time will the ball arrive at the point C?

26. *By Mr. Thomas Whiting.*

Suppose the monument near London-bridge to have been made of lead, the circumference=100 yards, and perfectly cylindrical; to what height must it be raised so that its weight must be nothing: And also, to find what two heights it must be carried to so as to weigh 9999999 tons: Lastly, to find its height when its weight is a maximum?

27. Given the chord AB , and the versed sines of the two segments of circles AEB .

and AGR on line EF so that EG:GE may obtain a given ratio.

28. By Mr. Thomas Whiting.

A is a weight to be moved along the line AGF by two men, AB and AC are two ropes each = 100 feet, BG is = GC = 10 feet, at B and C are two upright small posts, the two men are to take hold of the ropes, and to keep them in contact with the posts B and C till the weight arrives at G. Required the nature of the path passed over by the men, its area and length, also its greatest ordinate, likewise the position of DH, EH when each man applies the same force as one man must do to draw it in the direction AF?

29. By Mr. John Lowry, of Houghton.

Given two sides of a spherical triangle to construct it, when the angle at the vertex is equal to the difference of the angles at the base.

30. By Mr. Thomas Leybourn.

Required two numbers, x and y , such that

$$\begin{cases} x^2 + y^2 = \text{a cube number.} \\ x^2 - y^2 = \text{a cube number.} \\ x^3 + y^3 = \text{a square number.} \\ x^3 - y^3 = \text{a square number.} \end{cases}$$

This question has been done in the Palladium, but Mr. Leybourn thinks it admits of a better solution.

32. By Mr. Thomas Leybourn.

Suppose two unequal weights are connected by a cord passing over a pulley, to find the space descended by the greater, or ascended by the less in any given time (t); also, to find the number of vibrations made by the greater and less weight respectively, in the same time (t); as also the number of vibrations made by each weight, while the less weight is drawn up to the pulley by the descent of the heavier at the other end. The weight of the cord being considered in the solution.

32. Given the position of the lines AB and BE, and let distances BC, BD, BE, &c. be set off in any given decreasing progression, then through those points C, D, E, let indefinite lines be drawn from the point A. It is required to draw, if possible, a right line from B, so that the distances BF, FG, GH, &c. may be all equal; and if impossible to determine the locus of F, G, H, &c. when they approach the nearest to an equality, or otherwise when the position of BFGH is given.

New Queries.

1. By Henry Bell, of Howden Dock.

Fish, though living in salt water, are fresh to the taste; how is this accounted for? Also, which are the best books to study Natural Philosophy from?

2. Mr. Lunardi informs us, that when he had ascended to a certain distance from the earth, he found the air extremely cold, and his balloon covered with a dew-like frost. What reason can be assigned for this, it being in the middle of summer, and an exceeding warm day.

3. It is said that F. Truchet, in the Memoirs of the French Academy, shews that two square pieces, each divided diagonally into two colours, may be combined 64 different ways; so as to form so many different kinds of checker-work. How is this to be done?

All letters for the use of No. 4, to come to hand before the First of August, directed as usual. No. 4 to be ready on October 15, 1793. Query 7, No. 2, is taken from the Gentleman's Diary for 1788. Query 1 has been properly handled in the Gents. Diary. See Question 13, 1784, and its solution in the Diary for 1785.

ERRATA in No. 2, Question 21, for 1723, read 1793. Page 44, line 2, for 259, read 259a; line 19, read $Mn = 35 \frac{1}{2} 38'$. Page 45, for moon's orbit, read moon's apparent orbit. The solution to the Astronomical question, in the Receptacle, is right as it now stands; but however, we will make the alterations if the gentleman who sent them desires it; as it is equally right either way.

Mr. James Denningt answered Questions 11, 12, and 13, in No. 2. Mr. Ryley answered Questions 1, 6, 9, 12, 13, 15, and 17, in No. 2, and the 10th in No. 1. Mr. William Armstrong, a very ingenious young gentleman in Mr. Howard's School, Carlisle, answered Questions 6, 7, 10, 11, 12, and 17, in No. 2. Mr. Lowry answered Quest. 13, 19, 20, and 21, in No. 1. Mr. W. Davis answered Quest. 6, and 2 Queries in No. 2, and 4 Questions in No. 1; Mr. O. Gregory answered Quest. 6 and 7; Mr. W. Bardon answered Q. 9; Mr. Crosby answered Q. 10 and 12.

N. B. The last plate is a temporary one to illustrate the questions upon the wrapper.

N^o 4.

MATHEMATICAL,
GEOMETRICAL,
AND
PHILOSOPHICAL
DELIGHTS;

CONTAINING
ESSAYS, PROBLEMS, SOLUTIONS,
THEOREMS, &c.

SELECTED FROM AN EXTENSIVE CORRESPONDENCE,

By THOMAS WHITING,

TEACHER OF THE MATHEMATICS,

EDITOR OF THE SCIENTIFIC RECEPTACLE, AUTHOR OF THE MENTAL ACCOUNTANT,
AND SCHOOLMASTER'S ASSISTANT.

L O N D O N :

Printed for the Editor, and sold by T. N. LONGMAN, *Paragon-House*

M,DCC,XCIV.

[PRICE ONE SHILLING AND THREE-PENCE.]

[Price One Shilling and a halfpenny.]

NEW QUESTIONS.

1.* By Mr. James Stevenson.

GIVEN the solidity of a right hexagonal prism = 20000 inches, to determine its dimensions, when its surface is a minimum?

2.* By Mr. O. G. Gregory.

Suppose Georgium Sidus revolves round the sun in a circular orbit, which is 19 times farther from the sun than the earth is, and that the earth goes through her orbit (which we here suppose circular) in 365.2565 days: now if the projectile motion of Georgium Sidus were destroyed, how long would it be falling to the sun—gravity alone acting?

3.* By Mr. Olinthus Gregory.

Having the axis of a sphere; or the fixed and revolving axis of a spheroid; or the altitude and diameter of the base of a paraboloid; or the dimensions of the base, and the height of any prism or pyramid; to determine the content of either of them in ale and wine gallons, malt bushels, and cubic feet, at once setting the slide on the gauging rule?

4.* By Mr. Thomas Leybourn.

How many forms of a geometrical progression may be made with 5 threes?

5.* By Mr. J. Lowry, of Houghton.

Given the difference between each side, and the adjacent segment of the base made by the perpendicular and the difference between the perpendicular and radius of the inscribed circle to construct the triangle?

6.* By Mr. J. Lowry.

Given the vertical angle, one side and the difference of the angles at the base of a spherical triangle to construct it?

7.* By Mr. J. Lowry.

Given the vertical angle and the side of the inscribed square, to construct the triangle, when the rectangle of the sides is to the square of the base in a given ratio?

8.* By Mr. J. Lowry.

Given the base, the difference of the sides, and the radius of the inscribed circle of a spherical triangle to construct it?

9.* By Mr. J. Lowry.

Given the line bisecting the vertical angle, the $\perp$ and the radius of the inscribed circle of a spherical triangle to construct it?

10.* By Mr. J. Lowry.

Given the radius of the circumscribing circle of a spherical triangle, and the segments of the base made by the perpendicular to construct it?

11.* By Mr. O. G. Gregory.

There is a circle, the sum of the areas of whose circumscribed and inscribed squares is 125.5: required the area of the circle; the dimensions and area of its greatest inscribed right angled triangle; also, the dimensions and area of the inscribed duodecagon?

12.* By Mr. John Salter, of Bilston.

Given $x + y^2\sqrt{z} = 1775$, $xyz = 28336$, and $x^2y^2z + x^2y^2 \times 14/x^4 = 178149848800$. Where x represents the year, y the month, and z the day of the month wherein I was born, by a simple equation?

13.* By Mr. J. Salter.

AECFB is a given semicircle, EF a chord given in position, it is required to draw geometrically a right line ADC cutting EF in D, so that the intercepted part DC may be equal to a given line?

14.* By Mr. John Griffith.

Suppose the frustum of a cone, whose length and diameters are 30.20 and 10 respectively to be divided into two equal parts by one cut beginning in the middle, quere the direction of the saw or the $\angle$ it must make with a line parallel to the base.

15.* By Mr. J. Lowry.

To determine a point P in a given parabola ABC so that drawing PD parallel, and PQ perpendicular to the base AB; PD + PQ may be a maximum; also to determine

the said point when the area of the part ADPQ is a maximum; and lastly, supposing the point P given, to draw two lines Pm, Pn including a given angle so that the area of the space Am Pn may be a maximum?

16. *By Mr. J. Lowry.*

There is a candle 12 inches high, placed perpendicularly on an horizontal table, and also a glass in the form of the frustum of a cone, having its top diameter 3.5, bottom diameter 2.4, and height 4.2 inches. Required the area of the space made by the shadow of the glass on the table; the distance between the centres of the bottom of the glass and that of the candle being 8 inches?

17. *By Mr. J. Lowry.*

P is a given point without a circle ACB given in magnitude and position. It is required to find another point D within the circle, so that drawing ADB intersecting the circle in D and B and joining PA, PB; AP^2 may be to BP^2 as AD to BD.

N. B. This question has been proposed before but not answered.

18. *By J. P. O'Sullivan, Esq.*

From the following equations, be pleased to try, if you can find x equal four * times

$$y. \quad x + y + \frac{x^3}{y} = 144, \text{ and } x^2 + y^2 + \frac{x^5}{y^2} = 4608.$$

* See Mr. Eadon's solution to this question in No. 5, of the Scientific Repository, and the Editor's remarks on it.

19. *By Mr. William Armstrong, Pupil in Mr. Howard's School, Carlisle.*

Given the difference of the segments of the base made by a perpendicular, the difference of the squares of the two sides, and the difference of the angles at the base, to construct the triangle?

20. * *By Mr. W. Armstrong.*

A gentleman dying, left by will, a field in form of a parabola; between his son and daughter, the land was divided into two equal parts by an hedge drawn parallel to the base, on account of their different qualities; viz. the part next the vertex was worth 20 and the other 8s. per acre; but he wished to have it divided between them by an hedge drawn parallel to the abscissa, and that the value of the son's part might be double that of the daughter's; now supposing the abscissa to be 18 and that a line drawn from the corner of the base to the focus measure 20 chains; at what distance from the abscissa must the line of division be drawn?

21. *By the Rev. Theophilus Grove.*

Globi duo A et B (quorum prioris pondus est unciarum alterius 10) à viris duobus 150 pedes distantibus per aream congelatam simul projiciuntur, et factà percussione mutuâ, ad plagas diversas tendunt. Summa spatiorum à globis ante impactionem percussorum æquat 335 pedes et minoris momentum ad momentum majoris eandem tenet rationem quam 7 ad 3. Planum autem globos in puncto concursus tangens, ex aquo secat virorum distantiam, et vis compressiva est ad vim elasticam ut 16 : 7. sepositâ glaciæ frictione et aliâ quâvis causâ motum retardante: Investigentur directio et celeritas utriusque globi impingendo acquiratæ.

Required an English translation and solution.

22. *By Cullen O'Conner.*

Given the sums of the powers of the roots of an equation, it is required to investigate the law of the series expressing the coefficients?

23. *By the same.*

Transform an equation into another, the roots of which are the m th powers of the roots of the original equation?

24. *By the same.*

When parallel homogeneous rays are refracted by a plano-convex lens, the diameter of the circle of aberration, is equal to half the lateral aberration of the extreme rays? Required a proof.

25. *By the same.*

A cylindrical beam of homogenous light transmitted through a prism, remains cylindrical, in the case in which the image is stationary, i. e. does not move, on beginning to turn the prism round its axis? Required a proof.

26. *By the same.*

What is the reason that the time of full tide in the open sea, is not when the moon is in quadrature, but three hours before it?

27. *By Mr. Thomas Whiting.*

There is a clock which keeps true time at London, its pendulum is 6 inches long. Now admit this clock to ascend perpendicularly upwards with an uniform velocity of 1 mile per day; how much will it gain or lose in 400 days; and how many times will it vibrate in 1 minute when arrived at that height?

28. *By Mr. Thomas Whiting.*

Given the height of a candle ± 12 inches, and the height of a perpendicular object ± 1 inch, also their distance asunder ± 10 inches. Now suppose this perpendicular object to move in a circle once round while the candle burns down 2 inches, to determine the space passed over by the shadow of the object; and also to find the distance passed over by the apex of the shadow?

N. B. The object moves round the candle upon an horizontal plane.

29. Given the ratio of the equatorial to the polar diameter of the earth as 1 to c ; the moon's equatorial horizontal parallax $\pm p$; the latitude of the place, and true altitude, and azimuth of the moon, to find the parallax of altitude and azimuth, supposing the earth to be a perfect spheroid?

30. A man was walking along the foot of an hill, and at the top of it he had the sight of a tower, bearing N. N. E. and by observation its altitude was $18^\circ 20'$; travelling on E. S. E. for the space of 880 yards he found it to bear N. W. by N. and its altitude only $12^\circ 40'$. How far was he from it when he first saw it? What was the height of it above the level, and the difference of height from each place of standing?

Mr. Keith informs us, that he found the above two questions among the manuscripts of the late Mr. Stephen Hartley, of Sowerby Bridge.

31. *By Mr. Thomas Whiting.*

There is an ellipsis, whose diameters are 15 and 10 feet respectively, in the centre of which stands a lamp 10 feet from the ground, and suppose a man 5 feet high to walk once round the circumference of the ellipse. Required the area of the space passed over by his shadow, also the circumference of the shadow's extremity, and nature of the curve?

32. *By Mr. Thomas Leybourn.*

Required the area of a curve, whose equation is $(1 - x^{60}). y^{n+1}x + (x^{18} - x^{10} - x^8 - 1). y^{n+2}x^2 + (1 - x^{60}). y = (1 + x^{10} + x^8 - x^{18}). x^{12}$.

REMARKS TO CORRESPONDENTS.

Carnan's Diary, commenced in 1776, and was continued until 1788. There were three Supplements to it in the years 1779, 80, and 81. The Palladium made its appearance first in the year 1749, and died with its author in 1779.

We return sincere thanks to all those gentlemen who have promoted and encouraged this publication; and we beg leave to remark, that we intend publishing annually instead of half-yearly. No. 3 to be ready on the 1st of April, 1795. Letters (post paid) for the use of No. 5, to come to hand by the 1st of October, 1794, directed to Mr. T. W. to be left at Mr. Longman's, Paternoster-row, London.

Mr. W. Armstrong, pupil to Mr. Howard, answered questions, 2, 3, 4, 5, 7, 8, 9, 10, 11, 20, 21, and 24. Mr. W. Burdon answered the 13th; Mr. James Deanington, of London, answered 2, 7, 8, 10, 12, and 20; Mr. O. G. Gregory, answered 5, 12, and 14; Mr. Lowry, of Houghton, answered 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 16, 20, 21, 24, and 27; Mr. Richard Nicholson, of Kirkstovew-blow, answered 7 and 8; Philologus answered 4 and 13; Mr. John Ryley, of Leeds, answered 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, and 14; Mr. Thomas Leybourn answered 1, 12, 14, and 24; Mr. John Saker, of Bilton, answered 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, and 13; Mr. Thomas Hewitt answered 1, 3, 9, and 11.

Mr. Armstrong observes, that question 6, No. 3, was proposed at page 76, of Dr. Hutton's Math. Miscel. solved at page 89, and at page 187 it is shown that the data is insufficient. Momentum has mistaken Mr. Emerson, he makes it as the base to the sum of the sides.

On account of an extra plate and other additional expences attending this publication, the Editor is under the necessity of advancing the price to One Shilling and Three-pence per Number.

N^o 5.

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And sold by T. N. LONGMAN, *Paternoster-row*. 1794.

[Price One Shilling and Threepence.]

NEW-QUESTIONS.

Question 1, by Mr. James Stevenson, of Heath.

GIVEN $x^{\frac{am}{n}} y^{\frac{m}{n}} - x^{\frac{m}{n}} y^{\frac{am}{n}} = a$, and $x^{\frac{3m}{n}} - y^{\frac{3m}{n}} = b$; to find x and y ; and to give an example when $a = 120000$, $b = 387000$, $m = 100$, and $n = 99$.

Question 2, by the same Gentleman.

Given the solidity of a right dodecagonal pyramid = 36000 inches, to determine the dimensions, when the surface is a minimum?

Question 3, by the same Gentleman.

Given the area, and two opposite angles of a trapezium ABCD, whose sides AB, BC, CD, and DA are to each other as four known quantities a , b , c , and d , respectively; to find the sides, and diagonals?

Question 4, by the same Gentleman.

What proportion is there between the force of gravity at the surface of the earth and Georgium Sidus?

Question 5, by Mr. Nicholson, of Kirkbyoverblow.

Surveying a field in the form of a parabola, the base of which was 12 chains, in a diameter and from its vertex I measured 284 links at the outside of the field, and then found if a tangent were drawn from thence to the hedge, it would just cut the base when produced 160 links from the corner of the field: Required a geometrical construction of the field, when the diameter is the axis and the base an ordinate to it, also the area, without algebra or fluxions.

Question 6, by Mr. William Davis.

There is an Island, whose area is 70686 square feet, round which is a concave semi-circular ditch, whose radius (or depth in the middle) is 6 feet, in the center of the Island stands a may-pole 300 feet high; it so happened that a high wind broke the pole in such a manner, that the top struck the ditch 30° beyond their middle. How high is the piece left standing?

Question 7, by Mr. Archibald Gilchrist.

Suppose two candles placed at an equal distance from the center of a round table, and on opposite sides, for example half way between the circumference and center. It is required to determine whereabouts in the circumference of the table the quantity of light is the greatest?

Question 8, by Mr. Thomas Whiting.

A person fired a cannon from the top of a Tower 100 feet high, with the initial velocity of 120 feet in a second, and the ball was observed to fall at the bottom of a conical building at the same instant the sound reached the top. Required the height of the building, and elevation of the piece, the horizontal range and solidity of the building being the greatest possible.

Question 9, by O. G. Gregory, of Taxley.

Given $4\sqrt{x^3y} + x^3 \times 3\sqrt{x^2y} + 2xy^2 - y^3 = x$, and $x^2 + 2xy = b^2 - y^2$, to find x and y when b^2 is equal to the number of inches in a cubic foot.

Question 10, by Mr. O. G. Gregory.

How far from the foot of a steeple which is 50 yards in height, must a person (the height of whose eye is 5 feet) stand, so as just to see the top of the steeple? The earth being supposed a perfect sphere, in diameter 7964 miles.

Question 11, by Mr. William Davis.

There is an hill in the form of the frustum of a cone, its circumference at bottom is 4 furlongs, ditto at top, 1 furlong, and $\perp$ altitude $\frac{1}{4}$ of a mile. Now suppose a team of horses (capable of drawing 20 cwt. on level ground) to be employed in drawing 18 cwt. up this hill, and to go at the rate of 2 miles an hour; in what direction must they go, so as to perform their journey in the least time; and how far must they go before they reach the summit of the hill?

Question 12, by Mr. Jonathan Mabbot, of Oldham.

At page 85 of Collin's *Commercium Epistolicum*, Sir Isaac Newton lays down two series for reversion, and afterwards says: *Alterum modum regrediendi ab Arcis ad Lineas rectas celare statui.*—Quere, what that method is which he there is said to conceal.

Question 13, by Mr. Jonathan Mabbot, of Oldham.

Sterling, at page 27 of his *Methodo Differentialis*, says, that the aggregate of the thirteen initial terms of the series $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \frac{1}{4.5} + \frac{1}{5.6} + \frac{1}{6.7} + \frac{1}{7.8} + \frac{1}{8.9} + \frac{1}{9.10} + \&c.$ is equal to .674285961: Quere the investigation.

Question 14, by Mr. Joseph Dean.

BC is a semicircle, AC and BC are two equal tangents drawn from its extremities to the point A. Required the content of the solid generated by the revolution of AB, BC about AC?

Question 15, by Mr. Thomas Leybourn.

What number is that which being any how divided, the square of one part when added to the other shall always be a square number?

Question 16, by Mr. Leybourn.

To find a fraction such, that being taken from its reciprocal the remainder shall be a square.

Question 17, by Mr. Leybourn.

To find 3 biquadrate numbers, the sum of which shall be a square.

Question 18, by Mr. Leybourn.

To find 3 numbers such, that if their sum be multiplied by the first, it shall be a triangular number, by the second a square, and by the third a cube.

Question 19, by Mr. Leybourn.

Required the sum of the series $\frac{1}{1.4} + \frac{1}{2.5} - \frac{1}{3.6} - \&c. \frac{1}{x.(3+x)}$ by Mr. Sterling's method.

Question 20, by Mr. Leybourn.

Required the sum of the series $\frac{1}{2.6.8} + \frac{1}{3.8.10} + \frac{1}{4.10.12} + \&c.$ by Mr. Sterling's method.

Question 21, by Mr. Leybourn.

Required the sum of the series $\frac{1}{2.6.4.5} + \frac{1}{4.8.5.6} + \frac{1}{6.10.6.7} + \&c.$ by Mr. Sterling's method.

Question 22, by Mr. Leybourn.

Required the sum of the series $\frac{1}{1.2.6} + \frac{3}{1.3.8} + \frac{5}{3.4.10} + \&c.$ by Mr. Sterling's method.

Question 23, by Mr. Leybourn.

Required the sum of the series $\frac{1}{1.9.10} - \frac{1}{2.12.12} + \frac{1}{3.15.14} - \&c.$ by Mr. Sterling's method.

Question 24, by Mr. Leybourn.

Required the sum of the series $\frac{1}{1.6.10.21} - \frac{1}{2.8.12.24} + \frac{1}{3.10.14.27} - \&c.$ by Mr. Sterling's method. Mr. Clark says the above are thought incapable of summation; I doubt not but some of your ingenious Correspondents will shew us to the contrary. T. L. Mr. Leybourn observes, that some of his diaphantine problems have been done before but not satisfactorily.

Question 25, by Mr. Richard Jackson, of Beverly.

I say the altitude of the conical part of the upheaped Winchester bushel is equal to the depth of the half bushel; and that of the half bushel to the depth of the peck; and so of the rest to the pint. Required a demonstration?

REMARKS TO CORRESPONDENTS.

No. VI is to appear on Midsummer day, 1795. All letters for the use of the next number are to be directed (post paid) to Mr. Whiting, near Westminster-bridge, Lambeth, or to be left at Mr. Longman's, Paternoster-row, to come to hand by May 1.

This number was not to have appeared until Spring, but as the editor is joined in the expense by three other gentlemen, it was their wish to have it out on Christmas day; and to continue it half yearly; that is, on every Midsummer and Christmas day.

Mr. Armstrong answered his own questions. Mr. Ryley sent answers to some, and intends sending more; we are sorry his solutions came too late. Mr. Mabbott answered 1, 12, 18; Mr. Swale answered 1, 2, 6, 9, 10, 11, 12, 15, 20, and 31, with an approximation to the answer to 28 and 16; Mr. Stevenson 4; Mr. R. Nicholson 5, 7, 11, 19, 20; Mr. Paul Measor 5, 11, 19, 20, and 31. Nifoncho Academician answered the Enigmas, Charades, &c. in verse; as did Mr. O. G. Gregory, and Mr. Paul Measor. Mr. Bickford's letter, containing solutions to several questions, came too late to be made use of.

The Editor, Mr. Davis, Mr. Leybourn, and Mr. Kemmish return sincere thanks to the ingenious contributors, and hope for a continuance of their favours.

N^o. 6.

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M DCC XCV.
[PRICE ONE SHILLING and THREE-PENCE.]

NEW QUESTIONS.

1. By Mr. Joseph Dean.

GIVEN the chord of an arch = 10, and versed sine = 4, to draw three equal tangents to it; one parallel to the chord, and the other two to meet the chord produced, as per margin.

2. By Mr. James Stevenson.

Given $x^{\frac{m}{n}} - y^{\frac{m}{n}} = a$, and $x^{\frac{am}{n}} + y^{\frac{am}{n}} = b$; to find x and y : and to give an example $a = 32$, $b = 1762$, $m = 12$, and $n = 7$?

3. By Mr. James Stevenson.

Given $x^{\frac{m}{n}} - y^{\frac{m}{n}} = a$, and $xy|^{\frac{m}{n}} = b$; to find x and y : and to give an example when $a = 640$, $b = 27200$, $m = 16$, and $n = 11$?

4. By Mr. Newton Bosworth, of Peterboro'.

The area of an ellipsis is 94.248, and its largest diameter 40. Required the area of the inscribed square, the area of a circle inscribed in that square, and the side of an equilateral triangle inscribed in that circle?

5. By Mr. O. G. Gregory.

On the 8th of April, 1795, in a certain North latitude under the meridian of Greenwich, the true altitude of the sun's centre at 6 o'clock P. M. solar time, was $5^{\circ} 51' 29''$: when it was 6 o'clock P. M. solar time, on the same day, at another place on the same parallel of latitude, having 90° of west longitude. What was the sun's altitude; and what his meridian altitude at each place?

6. By Mr. O. G. Gregory.

The distance on the absciss of a parabola from the focus to the vertex is 3 inches: now, if tangents to the curve be drawn from the end of the right parameter till they meet each other; it is required to find the content of the solid generated between these tangents and the curve, whilst a revolution is performing round the parameter as an axis?

7. By Mr. O. G. Gregory.

There is an ellipse, the transverse and conjugate of which are 12 and $4\sqrt{5}$ inches. If tangents to the curve be drawn from the ends of the principal latera recta, until they meet each other and form a parallelogram; it is required to find the difference of the contents of the solids generated by these tangents, when the revolution is performed round the longer and shorter diagonals of the parallelogram respectively?

8. By Mr. O. G. Gregory.

The breadth of a piece of timber is 12 inches, and the depth is such, that the weight it will bear when its narrower face is parallel to the horizon, is in proportion to the weight it will bear when its broader face is parallel thereto as 3 to 2. If the transverse and conjugate axis of a prolate spheroid be equal to the breadth and depth of this piece of timber, what will the contents of the greatest square prism and square pyramid that can be inscribed therein; and what is the difference between the contents of the greatest cylinder that can be inscribed in the pyramid, and the greatest cone that can be inscribed in the prism?

9. *Fy Philo Mercator.*

Suppose a ship in latitude $49^{\circ} 30'$ N. sails directly W. 136.4 miles on the same parallel; and another ship from the same meridian sails from the equator unto the same place with the former ship. Now, if the difference of longitude of the first ship be found by parallel sailing, and of the latter by Mercator's sailing, (using the 136.4 as the departure) the difference of longitude of the two ships differs about 50 miles; how is this great difference accounted for?

10. *By Mr. W. Armstrong, Pupil in Mr. Howard's School, Newcastle-on-Tyne, late of Whiteclofe-Gate, near Carlisle.*

ACB is a given parabola, it is required to determine geometrically a point P in the base AB, so that drawing $PQ \perp$ thereto, and meeting the curve in Q; $AP + PQ$ may be a maximum?

11. *By the same Gentleman.*

It is required to determine a point P in the diameter AB of a given semi-circle; so that if upon AP and BP, two semi-circles AmP , PnB be described, the sum of their areas, may be to the space ACBn PmA in any given ratio?

12. *By Mr. Featherstonhaugh, Pupil to Mr. Howard, as above.*

GODA is a given right line passing through the centre O, D, of two circles GC, ED given in magnitude and position, it is required to draw a right line from one extreme A and cutting the circles in B and C severally, so that joining GC, GB the difference of the triangles GBA, GCB shall be given.

13. *By Amicus.*

There are two towers AD ($= 300$ feet) and BC ($= 200$) two balls are supposed to be let fall at the same time from D and C down the inclined planes DB and CA: it is required to find the situation of the two balls when they are nearest together; also when one is perpendicularly over the other?

14. *By Mr. James Stevenson.*

Given the vertical angle, and sum of the including sides, to determine the triangle when the square of the $\perp$ is equal to the area.

15. *By Mr. Thomas Leybourn.*

Mr. Simpson at page 435, article 373, from the equation $\ddot{x}x = (\dot{y}\dot{y} + \dot{x}\dot{x}) \times D^2x \ddot{x}$ finds $x = \frac{y^3}{p} + \frac{Dy^3}{3p} + \frac{D^2y^4}{12p}$, &c. Query the investigation.

16. *By Mr. Thomas Leybourn.*

Mr. Simpson at article 422 of his Fluxions derives the equation $\frac{\dot{z}}{\dot{x}} = \frac{pR \pm qS}{Q}$ from article 207. Query the investigation?

17. *By the Rev. Theophilus Grove; translated by Mr. William Nobes.*

Two globes A and B (the weight of the first to that of the second as 1 : 10) are projected on a smooth surface by two men 150 feet distance from each other, they meet and then take different directions, the sum of the spaces run over by the globes before collision is $= 335$, and the momentum of the less is to that of the greater as 7 : 3. But the plane touching the globes that meet in a point divides the distance of the men into two

equal parts, the compressive force is to the elastic as 16: 7, setting aside friction and other causes retarding the motion. Let the celerity, and direction of each globe acquired by the collision be investigated.

18. *By Mr. John Bickford.*

Let AB be a rod of iron of 1 inch square and 72 inches long, suspended in the middle by a rod of iron CF firmly fixed at right angles thereto at F: the rod CF being half an inch square and 15 inches long: at A and B are two weights appended, D being 48lb, and E 36. Required the position of rod AB when the whole is suspended at C?

19. *By Mr. Thomas Keith.*

If an isosceles triangle be cut by a plane parallel to the base, so that the base of the section be to the base of the triangle in the ratio of m to n ; and the segment of the perpendicular next the base of the triangle be divided into three equal parts, I say that the centre of gravity of the trapezoidal frustum or surface, formed by cutting the triangle, will divide the middle part in the same ratio of m to n . Required a demonstration, purely geometrical, without reference to the centre of gravity of any other known figures?

Query, by Mr. Newton Bosworth.

Why do Mathematicians (sometimes) limit a variable quantity by a maximum, when, in reality, they mean to have it the least the proposition will admit of? And in what manner can a maximum or minimum be said to limit a variable quantity, when the former is infinite and the latter is nothing?

Query, by Mr. Thomas Whiting.

If small bits of cork, or other light substances, be put into a tea-cup or other vessel, containing warm or cold water, they will recede gently from the middle, but as they approach the side of the cup their velocity is exceeding great: but what is more extraordinary, if a little water be poured upon a dry table it will stand up on a heap, and then if bits of cork be applied to the side of the heap they will immediately ascend to the top and there remain. Pray, Gentlemen, how do you account for this?

REMARKS TO CORRESPONDENTS.

THE Proprietors return sincere thanks to all their kind Contributors, for their zeal in promoting the welfare of the Publication.

The Editor (for his part) has exerted himself as much as possible consistent with equity, to oblige all, in proportion to their merit.

No. 7 will be published on Christmas-Day, and all letters intended for its use, must come to hand (post paid) before September the 30th, or they will be too late.

Mr. William Armstrong, pupil in Mr. Howard's school, answered 1, 5, 6, 7, 8, 9, 10, 11, 12, and 17th Questions in No. 4, exclusive of those printed in this number.

Mr. William Featherstonhaugh, pupil to Mr. Howard, answered 4, 5, 7, and 19th Questions in No. 4.

Mr. Mabbott, of Oldham, Lancashire, answered 2, 9, 13, 20, 21, 22, 23, and 24th Questions in No. 5.

Mr. John Ryley, of Leeds, answered 1, 2, 3, 5, 6, 7, 9, 10, and 13th Questions in No. 5.

Mr. Hewitt, of Spitalfields, answered 1, 2, 3, 5, 6, 7, 9, 10, 13, 15, and 16th Questions.

The Proposers of Questions 1, 2, 3, 5, 6, 9, 10, and 13, in No. 5, sent Solutions with them.

N^o. 7.

MATHEMATICAL,
GEOMETRICAL,
AND
PHILOSOPHICAL
DELIGHTS:

CONTAINING
ESSAYS, PROBLEMS, SOLUTIONS,
THEOREMS, &c.

SELECTED FROM AN EXTENSIVE CORRESPONDENCE,

By THOMAS WHITING,

Teacher of the Mathematics,

EDITOR OF THE SCIENTIFIC RECEPTACLE, AUTHOR OF SELECT EXERCISES, A KEY

TO DITTO, &c. &c. &c.

L O N D O N:

Printed for the EDITOR; Mr. GALE; and Mr. KEMMISH, (the Printer); and
sold by T. N. LONGMAN, Paternoster-row.

M DCC XCV.

[PRICE ONE SHILLING and THREE-PENCE.]

New Questions to be answered.

1.—By Mr. John Griffith.

IT happen'd so upon a day,
 Two boys inclin'd to have some play,
 Procur'd a pole just twelve feet long,
 A tapering one, both strait and strong ;
 And in the middle made a dent,
 Which they did fix upon a point ;
 The lighter boy, he did intend
 To ride one foot from the small end ;
 His weight exactly was five stone,
 The other pounds just eighty-one,
 And he must ride just two feet on,
 Which being done, the case was plain,
 An equilibrium did remain ;
 The pole was oak, both dry and sound,
 Whose small end measur'd one foot round ;
 The greater end, pray find out, at your leisure ;
 Perhaps you'll be required the same to measure.

2.—By Mr. James Stevenson, of Heath.

Given the solidity of a right cylindroid = 60000 inches, whose ends are equal and similar ellipses, the transverse and conjugate of which are in the ratio of 9 to 7 ; to determine the diameters, circumference, and length, when the whole surface is a minimum.

3.—By Mr. Newton Bosworth, of Peterboro'.

The side of the greatest square that can be inscribed in the generating circle of a cycloid is 12 ; it is required to determine the content of the solid formed by a revolution of the cycloid about its base ?

4.—By Mr. Jonathan Mabbot.

Query. Whether in Dr. Hally's times of the sun's eclipses, respecting a plinian period ; there be an allowance of time, in regard to the moon's parallax ?

5.—By Mr. William Robinson, of London.

In a quadrangular field, the bearings of the opposite angles from each end of the South-side is N. W. by N. and E. N. E. also the bearing and length of the same side is W. by N. 1045 links, and the distance of the N. E. corner from the intersection of the diagonals is 845, and of the N. W. corner from the said intersection 690.—Query the area of the field ?

6.—By *Cosmopolite*.

If a point be taken any where within an equilateral triangle, and three $\perp$'s. be let fall from that point on the three sides; the sum of these perpendiculars is equal to the $\perp$ of the triangle. Required a new and concise geometrical demonstration?

7.—By *Mr. John Griffith, of London*.

Let there be a right line, circle and parabola, all given in magnitude and position, and required to draw 2 right lines from the extremes of the lines; one to cut the circle and the other the parabola. So that joining the points in the curve of the circle and parabola, where the said lines cut the curves the sum of the three lines, so drawn, shall be a minimum.

8.—By *Mr. J. Fletcher*.

Admitting rain falls towards the earth with a velocity of 100 feet per second; and (by reason of the action of the wind) to make with the horizon an angle of 60° . What would the ratio of the quantities of water, falling on 2 equal vertical planes, moving at the rate of 4 miles per hour, one directly towards, and the other from the point of the wind.

9.—By *Mr. James Gale, Edgware Road*.

Given the diameters of the two wheels of a cart = 60 inches; the distance of the extremities of the wheels = 60 inches; the weight of the cart and load = 4 tons; and the height of the centre of gravity of the cart and load = 48 inches. Now suppose one wheel to fall into a circular rut, whose radius is = to that of the wheel's, and depth = to 6 inches; and the other to fall into a rut of the same radius, whose depth is 9 inches. It is required to determine the force necessary to draw the cart out; the ground being perfectly inflexible.

11.—By *Mr. Wolfenden*.

Given the base and vertical angle to determine the triangle, when the difference of the perpendicular and line bisecting the vertical angle is the greatest.

11.—By *Mr. Wolfenden*.

Given the diameter AF and the perpendicular ordinate PE of a semi-circle AEF; to draw geometrically the chord AC cutting PE in B, so that if ED be perpendicular to PE, the area of the right angled triangle BCD may be a maximum.

Prize Question by Mr. James Wolfenden, Hollinwood, near Manchester.

Required the sum of the infinite series $\frac{x}{2 \cdot 3} + \frac{3^2 \cdot x^5}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7} + \frac{3^2 \cdot 5^2 \cdot 7^2 \cdot x^9}{2 \cdot 3 \cdot \dots \cdot 11} + \frac{3^2 \cdot 5^2 \cdot 7^2 \cdot 9^2 \cdot 11^2}{2 \cdot 3 \cdot \dots \cdot 15}$, &c. by means of circular arcs and logarithms..

REMARKS TO CORRESPONDENTS.

MR. BICKFORD observes, that Rule to Prop. 3, page 136, is not general for finding the center of gravity of any segment of a sphere, but is true only in the semi-sphere, though asserted by Martin, in his Mathematical Institutions, Art. 1083; also by Ozanam in his Mathematics, and others.—The true Rule to find the center of gravity of the segment of a sphere is this:

From 8 times the radius of the sphere multiplied by the height of the segment, subtract 3 times the square of the height for a dividend: from 12 times the radius of the sphere, subtract 4 times the height of the segment for a divisor, the quotient arising will be the distance of the center of gravity from the vertex of the segment at C.

The following Questions, in the preceding Number, remains unanswered:

No. 1.—Question 5, 6, and 7.

No. 2.—Question 2, 4, 5, 8, 14, 18, 19, 20, and 21.

No. 3.—Question 15, 18, 22, 25, 26, 30, 32, and 33.

No. 4.—Question 16, 24, 25, 26, 28, and 29.

No. 5.—Question 8, 11, and 12.

There are 4 of the aforesaid questions not difficult. The Solution sent to question 16, No. 4, is not right. We are of opinion that the Solution sent to Question 16, No. 3 is not right. The Proposer is not the person alluded to.

We return thanks for past favours, and hope our learned Contributors will forward their Contributions by the First of May.

No. 8 is to appear on Midsummer-day.

Whoever truly answers the Prize Question will have a chance to win 6 Numbers of Delights.—And whoever truly answers the greatest number of the Questions left unanswered in the first 5 numbers, shall receive a Prize of 6 Numbers.—Also, the person who answers the Prize Enigma, shall have a chance of winning 6 Numbers of Delights.

The Prize of 6 Numbers of Delights has fallen (by lot) to James Gale, Esq. Edgware Road, for his Solution of the Prize Enigma.

Mr. Swale, of Leeds, answered Questions 1, 2, 3, 4, 6, 7, 8, 11, 12, and 14;—and 1, 2, 4, 8, 9, 10, and 12 of Mr. Lowry's

Mr. Mabbott, of Oldham, answered Questions 2, 3, 15, and 16.

Mr. John Ryley, of Leeds, answered Questions 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, and 2 others.

Mr. Gregory's Treatise on the Sliding Rule is to be published by Subscription, the price to Subscribers is 5s.—those who wish to become Encouragers, may please to signify the same to T. Whiting, who will communicate it to the Author.—Mr. John Ryley has signified his intention of subscribing for 6 Numbers of the Delights, for which the Proprietors are much obliged to him; as also to Mr. Nield for their worthy examples.

N^o. 8.

MATHEMATICAL,
GEOMETRICAL,
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M DCC XCVI.

[PRICE ONE SHILLING and THREE-PENCE.]

New Questions to be answered.

1.—By Mr. James Stevenson, of Heath.

SHEW how to find the square roots of 875 and 87.5 at one operation on a sliding rule, without having recourse to the line D.

2.—By Mr. James Stevenson.

Let it be required to determine two lines in a given ratio, so that if a given line be added to each, the sum of the squares of the compound lines shall be of a given magnitude.

3.—By Mr. James Stevenson.

To determine the greatest ellipsis that can be inscribed between the peripherys of two similar and concentric ellipsis, whose principal diameters are given.

4.—By Mr. O. G. Gregory, of Yaxley; Author of "*Lessons Astronomical and Philosophical, for the amusement and Instruction of British Youth*," just published.

A Surveyor is desired to set out a piece of land in form of a right-angled triangle, its content to be 9 A. 2 R. 14 P. and to contrive it in such a manner that a road straight across from the right angle to the middle of the Hypotenuse shall be just 10 chains long. Pray young gentlemen help him out, for the wiseacre is sadly puzzled!

5.—By Mr. Samuel Barrow, Assistant in Mr. Neild's Academy, Pen-y-lan.

Required the easiest, and most general method of calculating the places of notes, flat, sharp, and natural on the violin, on any length of strings; and the proportion of one length of strings to another from their identical notes.

6.—By Mr. Barrow.

Suppose a globe whose diameter is 9 inches, be placed on an upright pin 3-4 feet high in 40° of north latitude, when the Sun enters cancer: What will be the area of the shadow of the globe on the plane of the horizon in the space of three hours time?

7.—By Mr. James Gates, of Peterborough.

A candle 20 inches high was placed upon an elliptical table, whose transverse diameter = 26 inches, conjugate diameter = 18 inches, and height = 36 inches. It is required to find the area on the floor, darkened by the shadow of the table?

8.—By the same Gentleman.

Suppose a straight rod 13 inches long was placed perpendicularly before a candle 18 inches high, and 10 inches distance from the bottom of the candle. It is required to find the length of the shadow of the rod; its position when the shadow is a minimum; with the length of the shadow and position of the rod when a maximum?

9.—By Mr. John Knowles, of Liverpool.

In a given circle, the diameter of which is 20 inches, it is required to inscribe, by elementary principles, a trapezoid, when the sum of the squares of the parallel sides is to the difference of their squares as 7 to 5, and the least part of the diameter included to the sum of the parts excluded as 5 to 4.

10.—By Mr. Thomas Barlow.

To divide geometrically a given right line into two parts, such, that their rectangle may be to the sum of their squares in a given ratio.

11.—By Mr. Wolfenden.

Given the base and vertical angle, to determine the triangle, when the sum of the squares of the perpendicular and difference of the sides is the least possible.

Prize Question, by Mr. Robert Phillips.

If the equation of a curve be $x = \sqrt{b^2 + y^2} + b \times \text{H. L. of } y + \sqrt{b^2 + y^2}$, it is required to find its area; together with the content of the solid generated by the rotation of the said curve round its axis: supposing that when $x = 0$, $y = 0$.

A Query, by Mr. Newton Bosworth, of Peterborough.

It has been proved by repeated experiments, that neither spirits of wine, or any other inflammable liquor, can be set on fire by any burning glass yet made use of: How is this curious phenomenon to be accounted for?

A Query, by Mr. Edward Godwin, Master of an Academy, in Potsgrove, near Philadelphia.

What is the proper criterion by which we may distinguish animals from vegetables?

Another by Mr. O. G. Gregory.

Thunder Storms it is now generally conjectured are electric phenomena; agreeable to this hypothesis it is required to advance a satisfactory reason why they should occur more frequently at any place in Summer than in Winter.

REMARKS TO CORRESPONDENTS.

The Prize of 6 numbers has fallen to Mr. Wolfenden (without a competitor) for his solution to the Prize Question.

The Prize of 6 Numbers has fallen to the lot of Mr. Brown, for his solution of the Prize Enigma.

The prizes this time are as before.

No. 9 is to appear at Christmas, and all letters for its use must come to hand by September, 20th. directed (post paid) to T. Whiting, to be left at Mr. Longman's, Paternoster Row.

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N^o 9.

MATHEMATICAL, GEOMETRICAL,

AND PHILOSOPHICAL

DELIGHTS:

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Master of Kappel House Seminary,

FULHAM ROAD, near BROMPTON.

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[PRICE ONE SHILLING AND THREE-PENCE.]

New Questions to be answered.

1.—By Mr. T. Keith.

A T a Village in Yorkshire, on the brink of the swale,
Where cowslips and violets, their sweet odours exhale
Dwells a maid of real beauty, and with wisdom refin'd;
She's the pride of her sex—and the hope of my mind.
From the equations* below, learned gents, pray unfold
The name of this fair one whom I prize above gold.

$$\frac{w+x}{2} + y = 79$$

$$\frac{x+y}{3} + zw = 90$$

$$\frac{w+x}{5} + xy = 22$$

$$\frac{y+z}{7} + wx = 4$$

Where w, x, y , and z , shew the letters in the
alphabet composing her name.

2.—By Mr. George Clifton.

The three sides of a triangle are 13, 64, and 80 respectively (it is required to find the diameter of the inscribed circle, the side of a square inscribed in that circle, and the area of an isosceles triangle in that square?)

3.—By Ferdinando.

From one of the given points C, of a parallelogram ABCD; to draw geometrically a right line CEF, cutting DA in E, and BA produced in F; so that the sum or difference of the triangles CDE, EAF may be of a given magnitude?

4.—By Mr. Newton Bawerth.

Suppose a right cylinder and cone, whose altitudes are each 32 inches, and diameter of each at the base 24 inches, were cut by a plane entering at the edge of the base of each, and making an angle therewith of 48° : the favor is requested of Mr. Whiting's correspondents to determine the difference of the two ellipses thus formed.

5.—By Eradelfugo Banquin.

A gentleman has 5000*l*. which he puts out at 5 per cent per annum, compound interest: how much may he expend every day, so that both principal and interest may be entirely exhausted in seven years?

6.—By Mr. J. Collins, Schoolmaster, Kensington.

Three sides of a trapezium are 83, 72, and 55 chains respectively: required the 4th side which is the diameter of its circumscribing circle, and also the area?

7.—By Mr. J. Stevenson, of Heath, near Chesterfield.

Given the vertical angle equal to $50^\circ 50'$, and sum of the two including sides 100; to determine the triangle, when the biquadrates of half the difference of the said sides is equal to double the area.

8.—By Mr. Thomas Simpson Evans, Teacher of the Mathematics, at the Grammar School, Odibam, Hants.

Two men, A and B, agreed for two shillings to carry 2cwt. 2q. 12lb. of wheat 3 miles, on a pole 6 feet long. At their first setting out, the weight was 3 feet 4 inches from A; in which state they carried it 6 furlongs, where resting, they changed places, the weight continuing in the same place, and carried it 1 mile farther, where resting again, the weight was by accident moved to 30 inches from B, in which situation it was carried the remainder of the way. How much of the money must each man receive, in proportion to his trouble?

9.—By Mr. Joseph Woollin, of Smalley.

A gentleman having a garden in form of an equilateral triangle, in the midst of which stands a conical pillar, the diameter of its base 4 feet, and solidity 100 feet, and from the summit of the solid to the angle of the garden is 20 yards.—Now he would be obliged to any young student to tell him the area of the cultivated part of the garden.

10.—By Mr. John Eildes, Schoolmaster, Liverpool.

ABC is a triangular field, right angled at B, the side AB being 154 yds. in which at D 100 yds. from A stands a tree, and in the side BC there is another tree at E, 154 yds. from C; now if AE, DE and DC be drawn, the angle ACD and AED will be equal: required the area of the field.

11.—By Mr. John Rowbottom, West-Hallam, Derbyshire.

Four men, A, B, C, and D, undertook a bargain of work for 2611.—Now A could finish it himself in 4 months, B in 6, C in 9, and D in 12 months. But B began to work a certain time after A, and C and D both began together a certain time after B; when the work was finished, A received 131. 3s. 11d. more than C, and B and D received betwixt them 81. 1s. 7d. How long did A work before B began, and B before C and D began; what did each person receive for his work; how long was it in finishing?

12.—By Mr. John Knowles, of Liverpool.

If from the point P, in the diameter AB of a circle continued, any line be drawn to cut the circle in C, and again in D, and DE be drawn $\perp$ to AB, to cut the circle in E, and CE joined, then I say that CE will always cut the diameter AB, in the same point G. Query, a demonstration.

13.—By Mr. O. G. Gregory, Yaxley, Huntingdonshire.

If we admit that a musical chord, in length 20 inches, and weight 4.69097 grains, when stretched with a weight 8lbs. avoirdupois, will sound the note C sol-fa-ut; required the weight of chords of the same length and tension, which shall sound the diatonic, diatonic, and diapason to the above mentioned note.

14.—By Mr. Joseph Waters, of Gravesend.

To find three such cube numbers, that the product of any two of them being divided by the other, shall leave a cube number remaining.

15.—By Mr. J. Ashton, Harrington, near Liverpool.

If the wall of a house be 30 feet high, and a spout be fixed at the top thereof, of $2\frac{1}{2}$ feet in length from the wall, it is required to find the angle it must make with the plane of the wall, so that the water may fall into a reservoir, on an horizontal plane, at 10 feet distance from the bottom of the wall.

16.—By the same Gentleman.

Given the ratio of the base to one of the sides of an isosceles Δ , as 1 to r , and the area of its greatest inscribed ellipsis = a : It is required to find the dimensions of both, and give a demonstration of the process.

17.—By Mr. John Brooker, of Leeds.

Let BZ be an indefinite perpendicular to a given line AB, to which from A, draw any line APC, and take the point P such, that AC multiplied by PC may be equal to AB.—Required the properties of the curve, which is the locus of P.—N. B. This question has been proposed before, but not publicly answered, that I know of.

18.—By Mr. John Knowles.

Given the height of the eye, its distance from the picture and the position of an original point, to find its perspective representation geometrically, without introducing the point of sight, or station point.

19.—By Mr. R. Elliott, of Liverpool.

The fluxion of the tangent of 60° is equal to twice the fluxion of the tangent of 45° . Required the investigation by a general theorem, that will exhibit the ratio of the fluxion of any tangent to that of its corresponding arc.

20.—By Mr. John Brooks.

Given the difference of the sides, the difference of the segments of the base made by the perpendicular, and the radius of the inscribed circle to construct the triangle.

21.—By Mr. Richard Elliot.

Suppose the length, breadth, and depth of a cistern to be 16 (x) 12 (y) and 20 (z) feet respectively, and that there are 2 circular holes (each 1 inch in Diameter) one placed in the bottom, the other in the side close to the bottom. Now if it was filled with water, and both holes open, in what time will the whole be exhausted, supposing the velocity equal that generated by gravity through the whole height above the apertures?

22.—PRIZE.—By Cassia Broomwood.

In the midst of a gentleman's garden that's square, †
Is a circular fountain * of water that's clear; †

The gardener has orders a shrubbery to make, †
From the pond to two walks, and the area to take †

But it puzzles him quite.—For in curvature space, †
Not being acquainted.—So he begs for a place, †

In your fam'd Delights; and whoever unties †
This knot, with your leave, will be sure of the prize. †



† Side 200 yds.
† Diam. 81 yds.

† The walks are
parallel to the gar-
den walls, and dis-
tant therefrom 47.
24771 yds.

¶ If right lines be drawn through A, the extremity of the diameter of the pond that is parallel to the walks, and from the points M, M, &c. where these lines cut the circum. tangents, be drawn to cut the diam. produced in T, T, &c. then if from T, T, &c. be demitted upon the first mentioned lines cutting them at right angles in Q, Q, &c. these points Q, Q, &c. shall be in the fence of the shrubbery. He desires your ingenious correspondents to describe the fence, and give the area.

Query 1, by Mr. James Gates.

In the summer season in England, the wind sometimes blows from the North-East for several days together, at which time the weather is very dry and hot: Query. Why the weather should be hotter at that time, than when the wind blows from any other quarter?

Query 2, by The Rev. J. Shackleton.

We find that a Tufa, or Golden Ball, is now an usual sign of Majesty, and has lo been for a long time past. Pray how did it take its rise, at what place, and in what King or Emperor's days?

Query 3, by Mr. J. J. Thompson.

Whether a smoke jack will go best with 4, 5, or 8 wings; also why it will go better with a clear fire, than where there is a quantity of smoke?

REMARKS TO CORRESPONDENTS.

THE Prize of 6 Numbers for the Solution of the Prime Question, has fallen to the Lot of Mr. John Ryley, of Leeds. No. 10 is to appear on July 10; and all Letters intended for its Use must be directed (Postage paid) to Thomas Whiting, to be left at Mr. Longman's, Paternoster-Row—and the last of them must come to hand before June 1st.—Mr. John Ryley, of Leeds, answered Questions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12.—Mr. John Ward, Schoolmaster, of Atwick, answered the Enigmas, Charades, &c. and some of the Mathematical Questions.—Mr. J. J. Thompson, sent Solutions to the Enigmas, Charades, &c. and the 4th Mathematical Question.—Mr. James Boyce, of Birmingham, answered Questions 4 and 7.—Mr. James Stansfield, Pupil in Thornton School, near Bradford, Yorkshire, answered the 7th Question.—Mr. O. G. Gregory answered his own Questions, and gave Solutions to the Poetry and Queries.—Mr. James Gates, of Peterborough, answered Questions 4, 5, 7, and 8.—Mr. George Clifton, answered the Poetical Pieces and Queries, and the 7th and 8th Mathematical Questions.—The Rev. Mr. Shackleton answered all the Poetical Pieces.—Mr. Collins, Schoolmaster, in Kensington, answered Questions 4, 7, and 8, and all the Poetry.—Mr. R. Humber, of Brighton, answered all the Poetical Pieces and Queries.—Mr. Hewitt, of Spitalfields, sent Solutions to some of the Questions in No. 11, Receiptacle, together with Calculations of the Eclipses for 1797, but his Letter came too late to be even mentioned.—Mr. Dawes, of Birmingham, answered the 6th and 8th Mathematical Questions.—Mr. Newton Botworth, answered the 4, 5, 7, and 8th Mathematical Questions, and most of the Poetical Pieces.—Mr. Richard Nicholson answered Questions 2, 9, and 10.—Mr. J. H. Swale, of Leeds, answered Questions 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, and 12, in No. 8, and 1, 2, and 5, in No. 7. Mr. Swale's Letter containing Solutions to the Questions in No. 11 of the Receiptacle, did not come to hand till after the Number was printed.

10. MATHEMATICAL,
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Editor of the SCIENTIFIC RECEPTACLE.---Author of SELECT EXERCISES.---

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(2)

NEW QUESTIONS.

1. By *Tesvannes*.

GIVEN the velocity of a ball acquired by descending down the flant side of a cone, to determine the cone's dimensions, when its whole surface is a minimum ?

2. By *the same*.

To divide a given right line into two parts, such, that their rectangle shall be to the square of their difference in the ratio of m to n ?

3. By *the same*.

ABC is a plane triangle, the sides AB, BC, and CA of which, are to each other as three given numbers r , s , and t , respectively. Required the said sides when the sum of their cubes is equal to n times the area ?

4. By *the same*.

In a plane triangle are given the vertical angle and the sum of the including sides, to determine it, when the rectangle under the base, and the difference of the said sides is of a given magnitude ?

5. By *the same*.

There are three numbers in arithmetic progression, the sum of which is equal to their product, and the square of their sum is equal to the sum of their cubes. Required the numbers ?

6. By *L. W. D. of Brighton*.

I demand the side of the largest square that can possibly be described in the intersected part, formed by two circles whose semi-diameters are each 13, described at each extremity of a straight line, whose length is 20.

7. By *Mr. Thomas Leybourn, Editor of the Mathematical and Philosophical Repository*.

Let AB meet a circle in C and D, and let A be without and B within the same, and in AB let a point E be taken on the same side of A with B, such, that the rectangle BAE may be equal to the rectangle CAD, and also in AB, another point F, not on the same side of B with E, such, that the rectangle EBF may be equal to the rectangle CBD; and

through A any line be drawn meeting the circle in G and H, and BG; BH be drawn meeting the circle again in K and L; then I say the points F, K, L, are in a right line. Required the demonstration?

8. By *Mr. J. Collins, of Kensington.*

There are two numbers, whose sum added to their product equal 156.35, and the difference of their cubes equal 97323.022125. Query the numbers?

9. By *the same.*

Suppose a ship from the Lizard, sails between the South and West so far, until her departure from the meridian was in proportion to the distance sailed, as 5 : 9, and the sum of their squares equal 24077.9118985. I demand her course, distance, and the latitude and longitude she was then in, without the assistance of Algebra.

10. By *Mr. James Stevenson.*

Given the vertical angle, and sum of the including sides, to determine the triangle, when the square of half the base is equal to the area.

11. By *the same.*

Given the angle at the vertex, and the sum of the including sides of a plane triangle, to determine it, when the difference of the squares of the segments (made by the perpendicular falling from the said angle) of the base is equal to the area.

12. By *Mr. J. J. Thompson.*

What angle is best for the teeth of the wheel of a smoke jack to stand at, in order that it may turn round the worm fastest—and what angle should the flies make in order for the jack to go best.

PRIZE Question 14. By *Mr. Joseph Waters, of Gravesend.*

To find three such cube numbers, that the product of any two of them being divided by the other, shall leave a cube number remaining.

Query. By *Mr. James Gates, of Peterborough.*

Comets, on their approach to the sun, were conjectured by the ancient philosophers, to be excessively hot; and on the contrary extremely cold in their aphelion. The truth of this assertion is required from the present state of philosophy.

Remarks to Correspondents.

MR. Jonathan Mabbot sent a solution to the prize question in No. 8, but his letter did not come to hand till the Number was published.

No. 11, will be published on July 10th, 1798, and all letters for its use must come to hand before the *First of January*, directed for *T. Whiting, to be left at Mr. Longman's, Paternoster-Row, London*; and they must be franked, or post-paid, or they will not be received.

The Prize for the solution of the Prize Question has fallen to the lot of Philo. Amicus of Manchester—and that for the solution of the Prize Enigma, to Mr. Tayler, of Mansfield Place.

Mr. John Ryley answered all the Questions, except the 14th.

Mr. J. H. Swale answered the 15th, 17th, 20th, and Prize.

Philo. Amicus answered the Prize.

Mr. Dawes, Surgeon, answered the 10th, 15th, and 20th.

Mr. John Johnson, of Birmingham, answered the 2nd and 9th.

Mr. Joseph Cowley, of Birmingham, answered the 19th.

Mr. Collins of Kenfington, answered the 2nd, 3rd, 4th, 6th, 9th, 10th, and 11th.

Mr. Marrat, of Lincoln, answered the 6th, 7th, and 19th.

Mr. Joseph Hindson, of Lincoln, answered the 2nd and 8th Questions, and all the Enigmas.

Mr. Gates, of Peterborough, answered the 2nd, 3rd, 4th, and 13th.

L. W. D. of Brighton, answered the 1st, 2nd, 4th, 6th, 8th, 9th, 10th, and 11th.

Mr. S. Barrow, answered the 2nd, 5th, 9th, and 11th.

Mr. George Clifton answered the Prize Enigma.

Mr. J. Stevenson, of Heath, answered the 9th Question.

Most of the above letters came so late, that no use could be made of them; but as Questions 2, 4, 5, 6, 7, 9, 10, 12, and 14, are left for next Number, the Solutions sent to them will then be made use of.



